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A Framework for a Dynamic Metropolitan University

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Abstract

A Metropolitan University (MU) is deeply embedded in its local community, entwined in various economic, social, and professional networks over which creative and innovative ideas circulate. In keeping with its core mission of education, a MU can leverage these networks by implementing a research agenda designed to gain a better understanding of the propagation and exchange of ideas over the networks in which it operates. We refer to a university that has adopted such an agenda as a *Dynamic* Metropolitan University. Guided by a strategic plan that recognizes and supports the study of networks, a Dynamic MU is then positioned to effectively differentiate itself from online education, local community colleges, and less community-oriented universities.

Introduction

Twentieth century philosopher Karl Popper argued, quite eloquently and with an antithetical rationale, that the way to improve our understanding of the world is by adopting a mindset of empirical falsification. Propose a theory or idea and subject it to empirical testing designed to falsify it. If the theory stands up to the test, retain it, else revise it in light of new evidence or discard it in favor of a new one. It is only by the systematic and careful testing of ideas that one can get closer to the truth. Such a philosophy embraces creativity and innovation, expands knowledge, enriches lives, and results in a higher standard of living. Popper referred to this philosophy as rational criticism and we are suggesting that this philosophy ought to be at the heart of a Metropolitan University (MU) and its research agenda.[1]

Rational criticism may be viewed as a process that begins with ideas and questions, develops hypotheses, and then tests them with an eye towards refining and expanding the body of knowledge. It is all about critically evaluating ideas, but with a positive attitude driven by curiosity and directed at learning. It is a dynamic process of introspection and should represent the foundation for a research agenda of a MU striving for a competitive advantage.

This paper is not about promoting various programs and delivery methods that a MU might use to execute its mission, such as emphasizing experiential learning, creating certificate programs for non-matriculated students, hosting colloquium series for the public, inviting local experts to guest-lecturer, collaborating with businesses on projects, sponsoring internships, and the judicious use of adjuncts to balance the presentation of theory and practice. While such activities represent the pillar and bulwark of a MU, they are standard delivery modes for education. A philosophy of continuous improvement in their delivery should, however, be a component of any MU's strategic plan.

[1] The term rational in this context refers to the desire to eliminate contradictions in our understanding of theories. The rational criticism algorithm may be employed to eliminate empirically weak theories in favor of the best theory. Karl Popper was a twentieth century philosopher with a deep interest in the philosophy underlying the progress of science and epistemology. He put a great deal of thought into refuting inductive reasoning, which is the process by which various premises, all believed to be true, are combined to form a conclusion. Popper believed the algorithm of rational criticism lead to a better understanding of the world. A summary of Popper's work is woven together in *Popper Selections*, edited by David Miller (1985).

This paper is about adopting a research agenda of continuously proposing, testing, and refining ideas about how knowledge is transmitted back and forth between the university and the surrounding community. It is about recognizing and leveraging the social capital in and around the university that comes from relationships.[2] With an appreciation of social and economic networks, the university will be able to more effectively operationalize its overall strategic plan. There is nothing distinctive about adopting a strategy of simply collaborating with as many local businesses as possible, as it is the game plan for many regional universities, not just MUs.

An outline for the rest of the paper is as follows: Section I defines a dynamic MU in terms of its underlying objective of creating, promoting, and facilitating knowledge spillovers in collaboration with the community. The concept of knowledge spillovers, while abstract, is further developed as it relates to a MU in Section II. Since a MU is located in a community that covers a geographic area, knowledge spillovers are analyzed within the framework developed in the regional economics literature in Section III. Embedded in the region surrounding a university are its stakeholders and the various networks that link them together. These networks operate on a face-to-face level as well as virtually. The literature on real and virtual networks (mobile phones and the internet) is voluminous and it is not our intention here to conduct a comprehensive review. Instead, Section IV presents a brief literature review designed to enlighten the reader of the nuances of networks by surveying some of the ingenuous methods that researchers have employed to illuminate and map networks. Section V discusses how creative and innovative ideas, those leading to a new product, service, or improved production process, flow within and between networks. Most networks are composed, in part, of clusters or sets of tightly linked individuals. Understanding clusters and their position in a larger network illuminates bridges between clusters that create important opportunities for the flow of innovative ideas. A brief discussion of the connection between clusters and innovation is presented. Section VI concludes the paper.

I. A Metropolitan University

A MU collaborates with its community to promote a rich, vibrant economy using education and emergent knowledge as a shared goal. It goes without saying that a most universities exercise leadership in disseminating knowledge and educating the public as its faculty teaches students, conducts research, and

[2] Specific definitions for many of the terms used in this paper are not provided here, intentionally, to keep the context as broad as possible. That said, social capital is a term that needs at least a rough definition to help the reader. Social capital, more or less, represents the benefits derived from the interaction of individuals operating within a network. A MU should be mindful that community development, which leads to economic development, is about leveraging social capital.

presents their ideas to the community. But in a MU, the flow of knowledge also travels in the other direction. Knowledge flows from the community into the university and is absorbed by students and faculty. Community stakeholders with new ideas, inventions, and deep-seated knowledge of their business share their interests with, and through, the MU. The exchange of ideas and the flow of knowledge are referred to as "knowledge spillovers".[3] Knowledge spillovers are cultivated in communities with strong universities that play a pivotal role in the transmission of knowledge. A MU should go a step further than a typical university by adopting a mindset of rational criticism with an eye towards better understanding and improving itself.

II. A Metropolitan University and Knowledge Spillovers

A MU, under the guidance of a carefully crafted strategic plan, can operationalize its role in the creation, cultivation, and refinement of the theory and practice of transmitting knowledge over the various networks of its community stakeholders. But, how is knowledge transmitted and how are ideas exchanged from individual to individual? What exactly are knowledge spillovers and what does the various disciplines have to say about them?

Knowledge spillovers represent the exchange of ideas from one individual to another. The ideas could pertain to nearly anything, but within the context of a MU engaged in partnering with the local community, the scope is narrowed considerably to encompass creative and innovative ideas that lead to new products, product improvement, economic development, better public policy, or gains in productivity. In other words, activities and concepts that engage entrepreneurs. Knowledge creates opportunities, but someone needs to recognize these opportunities for them to materialize. Entrepreneurs embedded in the network are vital to the process. From this position, knowledge spillovers work hand-in-hand with Adam Smith's invisible hand metaphor. The metaphor suggests that the economy is comprised of entrepreneurial individuals acting in their own self-interest, and in doing so, promote the good of the overall economy and the welfare of the people in it. These self-absorbed individuals are not consciously promoting social well-being, yet the societal benefits derived from them are unmistakable. A MU armed with the right incentives, infrastructure, and mindset towards researching knowledge flow can

[3] The use of the term *knowledge* may be a bit vague here. It may be helpful to decompose knowledge into two components: explicit knowledge and tacit knowledge. Explicit knowledge is information that be easily transmitted via a text message, for example. The transfer of tacit knowledge such as technological innovative ideas, on the other hand, requires more finesse and is more in line with the discussion at hand.

simultaneously orchestrate Popper's rational criticism and employ Smith's invisible hand to improve its effectiveness.

The study of knowledge spillovers brings together the disciplines of economics, sociology, and network theory among many others. Taken together, these areas seek to explain the drivers of regional economic growth leading to higher standards of living and ultimately higher wages. While knowledge spillovers are difficult to observe, they are evidenced by publishing research and consulting reports and holding public lecture series, for example. [4] Traditional classroom activities with experiential learning, internships, invited guest lecturers, and community service also initiate spillovers. While these activities and publications are observable, interestingly, the resulting exchange of knowledge that leads to transformation is itself, unobservable.

Nevertheless, regional economic research is making progress in this area. Carlino (2014), for example, highlights the progress made in illuminating and promoting knowledge spillovers. His findings, which mirror the literature in general, indicate that knowledge spillovers propagate best in densely populated cities, with highly educated workers, and often with the aid of an embedded research university. The physical layout of cities, roads, airports, and railroads, the spatial organization of buildings, the location of rivers, ports, and bays all influence economic activity by directing the flow of people and hence their likelihood of meeting, see for example Carlino and Voith (1992) and Ciccone and Hall (1996).

There are several reasons that densely populated areas are important to regional economic activity. First, densely populated areas, such as cities, provide more opportunities for people in a network to interact with each other face to-face as they are more likely to cross paths. Face-to-face interaction, which is the most efficacious way of transmitting knowledge, keeps the network and its ties warm. This type of interaction does not have to come solely from planned events, but can result from random or chance meetings. Nevertheless, these meetings are more likely to happen in densely populated metropolitan areas with the right kind of infrastructure and amenities. Conveniently located coffee houses, active industry associations, and tightly clustered businesses in the same industry all support interaction and the flow of

[4] Admittedly, it is difficult to trace many of these activities to actual product development within a region. Patents, however, may represent an exception. Patent intensity (patents per geographic area) provides surrogate data for otherwise hard-to-trace knowledge spillovers. Carlino, Chatterjee, and Hunt (2007) state that patents generate legal documents that record among other things, the inventor's home address, including zip code. The authors collate this information with regional employment and geographic data and estimate that a doubling of employment density (jobs per square mile) in a metropolitan area leads to a 20 percent increase in patent intensity. Patent intensity dissipates significantly as one moves further away from a metropolitan area into less densely populated regions.

knowledge. Second, in more densely populated areas, the velocity of data transmission is higher as there is less chance for an idea to go cold. A cold idea is a missed opportunity.

A third characteristic of densely populated areas, and one that is crucial for the transmission of innovative and creative ideas, is a highly educated work force. For ideas to flow and ultimately to be productive, there must be capable transmitters relaying information and others seeking information. Cities have the population density needed to support very specialized jobs in monopolistically competitive markets that command a wage premium. The people seeking knowledge are likely responsible for producing a product or service in a competitive environment where innovation is needed for survival. As wages are correlated with labor productivity, an economically vibrant city is dependent on a strong network system to remain competitive. Florida, Mellander, and Stolarick (2008) argue that the right distribution of highly skilled and creative workers is needed to promote economic prosperity. Occupations in engineering, computer science, business and financial operations, art, and entertainment are among those most likely to lead to higher productivity and wages, thereby establishing a network channel for transmitting and then translating knowledge into economic development.

Exploring knowledge spillovers within networks draws on a vast array of disciplines found within most universities such as economic development, business, geography, urban development, communications, sociology, and public policy – just to list a few.[5] A MU with an interdisciplinary research agenda focused, in part, on knowledge spillovers is capable of better understanding the underlying mechanisms at work in their community. All regions are different. By studying the networks that facilitate local knowledge spillovers, a MU has the potential to identify unique characteristics in their community to promote economic growth and the network systems that carry them. When complemented with a continuous improvement philosophy, this research can advance a MU's mission.

This last point needs elaboration. The ideas discussed in this article are not just about building more relationships within the community – it's about developing and refining the economic theory underlying the flow of information over networks especially as it relates to creativity and innovation. A MU ought to strategically engage in interdisciplinary scholarly research that critically examines its role and effectiveness as a network player. Thus, the philosophy underlying a MU is more about epistemology and the continuous improvement of our understanding of the flow of knowledge over networks than simply conducting more community-building events.

[5] Networks are ubiquitous. Since each faculty, staff, and administrative member at the university is part of at least one, and probably many networks, the discussion at hand applies to the entire university and all its stakeholders.

III. Networks

Networks, in the context discussed here, are a collection of individuals affiliated by a common theme, responsibility, vision, interest, industry, or employer.[6] The connections between the various individuals are referred to as links and information shared between individuals is transmitted over these links. Geographically defined communities typically amalgamate a variety of different networks that are capable of carrying a wide range of knowledge and information. One example is the employment or job network for a community. Job networks are especially prevalent within communities as most people and their employers are located within the same community. But, within the employment network of a community are a multitude of sub-networks, often called components in network theory, depending on the industry and level. A professional network of certified public accountants, for example, is likely to carry different information than a network of software developers.

Job counselors, including university placement advisors, implicitly understand the value of these networks and often advise students seeking work to "network"; in other words, find and interact with the right set of individuals who might be carrying knowledge of job openings in a particular industry. Finding a well-developed professional network not only improves the chances that the individual locates a job that fits their skill set, often referred to as "matching," but also increases the employer's pool of qualified and potentially highly productive individuals ultimately improving society's well-being.

Interestingly, the U.S. unemployment rate is driven, in part, by the degree of skill mismatch in the economy. Skill mismatch is often measured by the Beveridge curve, the graphical difference between the unemployment rate and the job vacancy rate. The curve often is measured nationally, but can also be measured on a regional level. The monitoring and analysis of skill-mismatch provides extremely important information to policy makers and educators, both of whom seek to find remedies to alleviate the problem which tends to become more severe during recessions as job loss mount. According to Sahin, Song, Hopa, and Violante (2012) as much as 1/3 of the increase in the unemployment rate resulting from the great recession was due to skill-mismatch. Strong community networks have the potential to attenuate these circumstances by allowing individuals with a particular skill set seeking specialized jobs to locate firms seeking the same skills, and vice versa.

[6] For an excellent discussion and development of networks, see Easley and Kleinberg (2010).

Networks can be powerful, especially when they are highly connected in local communities. Highly connected individuals, who are geographically close, are capable of generating networks that are synergistic. In other words, the whole is more valuable than the sum of the parts. Thus, an individual who is adopted into a network, such as a club or professional society, may experience significant "wealth effects" merely by being associated with the network. In this case, the reputation of the network itself provides signals to outsiders about the individual. Such social capital can support and generate economic growth.

Social capital is gained from knowledge resources that are stored in social networks. According to Laursen, Masciarelli, and Prencipe (2012), social capital, which reflects the norms and network of a geographically bound community, is built on connectivity and trust. Connectivity summarizes the degree of social interaction among individuals within the community. Trust, on the other hand, reflects well-established close relationships that are developed through continuous interaction. In local communities, where random interactions are common, transparency and the ensuing trust is high. Through its ability to transfer knowledge within a local system, the strength of social capital, influences the degree of innovation that is embedded in that system. Consistent with Maskell and Malmberg's (1999) research findings, spatial clustering of activity, like that which emerges through a MU network configuration of academic and community interaction, will catalyze the processes of knowledge sharing and knowledge creation.

In general, the degree of knowledge diffusion present in a network is a function of the connectedness of the network. Tightly linked individuals use the same products, share the same technology, and converse in the same technical dialect during the course of their interactions. In other words, the people in their network share the same "inside" knowledge. In this case, the importation of "outside" knowledge leads to innovative opportunities for the network and economic growth for the community, see for example, Easley and Kleinberg (2010) and Karlsson and Gråsjö (2012). The importance of bridges, or links to other networks, is vital to bringing creative and innovation ideas into a network. According to Easley and Kleinberg (2010), individuals who bridge different networks are in pivotal positions when it comes to generating new ideas since an individual who bridges two networks embodies two different, yet overlapping, knowledge bases. Consequently, a mosaic effect results as innovation often comes from the synthesis of multiple ideas.

With an appreciation of networks and bridging, it is easy to see that a MU that concentrates on hiring professionals from within the local business community to teach in its programs strengthens the links

within the local network, but fails to import new knowledge from the outside the community and, therefore, limits its potential. With a mindset of continuous improvement and network engineering, a MU, can bring external knowledge into the community through the hiring of highly educated or experienced instructors from the outside. Typically, this translates into hiring instructors with Ph.D.'s or practitioners with executive-level experience to teach courses and interact with the local community. These kinds of instructors not only bring into the network new specialty knowledge from the outside, they also have the skill set needed to create and transmit highly technical tacit knowledge. Of course, a university needs to judiciously recruit faculty, in the appropriate disciplines, and provide them with direction about the university's strategic plan.

IV. Network Empirical Research

While the idea of a network may seem a bit nebulous and abstract, existing research provides methods of illuminating them without significant costs. The empirical research on networks is large, the coverage broad, and the insight it brings is deep. Novel ideas about how to expose the inter-workings of a network abound. For example, suppose you wanted to document the network links associated with an organization such as a university. You might begin with an analysis of the email activity of the people in the university. According to Kossinets and Watts (2006) email activity is highly positively correlated with other social activities such as face-to-face interaction and phone conversations where knowledge spillover can occur.[7] Simply by measuring the volume of email sent to selected recipients, the university can provide clues as to the extent and depth its links and bridges. A high volume of emails with a local business, for example, might indicate a long standing internship program or a collaborative research venture. A map of these links and bridges will provide an important first step in analyzing the university's network and possibly lead to diagnostic tools.[8]

Another example of network research employing email data also comes from Kossinets and Watts (2006). They collated three databases to evaluate the evolution of a large social network composed of over 43,000 undergraduate and graduate students, faculty and staff of a large university while cognizant of privacy issues by using encryption methods. The three databases are 1) the university's email system, 2) human resources and student registrar systems, and 3) university course scheduling system. For each transmission, the sender, list of recipients, along with a time stamp were obtained from the email

[7] See for example, Easley and Kleinberg (2010), Adamic and Adar (2005), and Kossinets and Watts (2006).
[8] To further develop this idea, consider a MU with mission of connecting to the business community. One way to evaluate its engagement with the community, and possibility its impact, is to compute the proportion of email transmitted to and from local businesses by using IP addresses. In a similar vein, a research oriented university might evaluate its capacity to bring in new ideas by measuring the proportion of its faculty coauthoring research with people from other universities.

database. Personal attributes relating to faculty, student, major, department, gender, years of service were pulled from human resource and registrar databases. Course schedule information for faculty and students were obtained. From the merged dataset, the authors attempted to assess the stability of various networks within and around the university, the effectiveness of bridges to other networks in the diffusion of information, the jockeying for strategic positioning within the network, and the impact that physical and social proximity had on decision making. The point of discussing the work of Kossinets and Watts (2006) is that similar databases exist at most universities and they can be mined by faculty and students to better understand the circulation of information on campus and with the community. Identifying previously unobserved and unknown networks, clusters, and patterns of communication could be advantageous to the university.

An interesting application of the use of technology in social network research is Eagle, Pentland, and Lazer (2009). Their research reflects a degree of creativity by exploiting mobile phone data to reveal network patterns concerning friends, jobs, and locations. Using cell phone data, including time and proximity via cell tower logs, the authors capture the location of dyad communications between friends relative to their geographic employment. From this data, the authors infer a level of job satisfaction based on communications among friends. The more calls that were sent or received closer to an employment location suggested higher job satisfaction. Why are these findings important to know? Because most information concerning job satisfaction is derived from survey-based data and surveys are notorious for incorporating misleading information through multiple layers of biasness. The conclusions drawn from data collected using mobile phone activity and interpreted through a network theory lens, can complement or even improve our understanding an underlying situation.

Mapping a network is an important early step in understanding the nature of a social network and its ability to exchange information. The results of such mappings can sometimes be surprising and counter-intuitive and, therefore, valuable in using and engineering networks. For example, Onnela et al. (2006) find that weak, i.e. bridging, ties are better than strong ties in conveying and diffusing information over a network. Onnela et al. (2006) employ call data from a mobile phone operator to develop the topography of a network that illuminates its communicative efficacy. They glean social network structure information from phone call records and their properties. The sample covered approximately 20 percent of a country's (left unspecified in the paper) phone volume over an 18-month period. The signature of a dyad relationship was inferred from the timing of calls – were they made during working hours, evenings, or weekends, the duration of the calls, the frequency of calls made between the two parties, and whether a call was reciprocated, i.e., a call-back. From this information, link or tie strength as the authors refer to it,

was determined to be weak or strong.[9] With this topography recorded in a database for analysis, the authors experimented with systematically removing rank-ordered weak ties and strong ties and observed the network's ability to carry information. The results of the experiment are surprising: removing weak ties in rank order (weakest first) deleted the bridges to other communities and lead to a slow collapse of the network, while sequentially the removing the strongest rank-ordered ties did not lead to a collapsing of the network. Since the database is so vast, the paper contends that the diffusion of information across a large network depends critically on weak links. In fact, the authors go as far as to say that a strategy for moving information across networks should focus on sending that information over the weak links rather than the strong ones. According to Florida (2003), such counter intuitive findings are not a surprise as other network research has shown similar results. He contends that strong ties are barriers to the diffusion of information across different networks (bridges) as they shut out innovative ideas. Weak ties, on the other hand, are more open to new ideas and are more likely to spread the information.

V. Networks, Clusters, and Innovation

Different networks are likely to utilize different technology and skill sets. As the previous section suggests, making a new bridge to another network or organization is far more likely to result in a significant transfer of innovative knowledge than a link from within the organization. An organization with bridges to many external organizations is likely to reap important innovations supporting its research agenda and vice versa. Thus, a MU might well benefit from endorsing and promoting the establishment of new bridges to external organizations by its faculty and researchers.

While networks themselves possess and transmit information, what fascinates regional economists is the mechanism by which innovative ideas flow over a region and into a sub-network such as a company, club, or professional organization. A large network, whether it covers a geographic area or not, often is composed of sub-networks or clusters, collections of individuals tightly woven together because they share the same beliefs and culture. Interestingly, each individual in the cluster may be sharing the same technology as it makes interaction within the cluster easier. Attempting to get an individual in such a network to adopt an innovative idea or a new technology is difficult unless there is a convincing argument in favor of adopting the new technology. The others in the cluster must also be convinced in order to convert them to the new technology or idea. Thus, an awareness of such idiosyncrasies within networks, borne out of research, may help in the flow of innovation within a community.

[9] Roughly, a strong tie refers to the close link between individuals within a network often because they interact frequently or share the same goals.

Networks often include various types of clusters and the bridges that link clusters. A precise definition of a cluster is difficult to pin down, but for our purposes it is a tightly linked set of individuals bound by a common goal, task, or interest; a network with a college, department, student club, or discipline could represent a cluster. A cluster is often a subset of a broader network and represents areas of intense interaction.

Clusters are quite common because of the competitive advantages offered, and therefore may be considered a form of economic network. Clusters often have a geographical context allowing for a variety of agglomeration economics to operate. For example, when firms in the same industry form a cluster, their suppliers have the ability to locate close by, thereby reducing costs. Also, over time, labor in the area becomes more specialized as employees spin off to open nearby businesses designed to capture untapped industry-related markets. More specialized labor leads to higher productivity and higher wages. The participants in a cluster are often keenly aware of their local competition as market share and product lines are conspicuous. According to Porter (1998) geographically-based clusters generate elements of strong local rivalry as well as cooperative behavior. At times rivalry springs up among nearby management teams as each firm prides itself in out-innovating and out-competing the competition, and in other times, cooperation ensues, especially in vertical clusters, as firms rely on each other for business. In both cases, productivity increases resulting from lower costs, increased revenue, or both.

The creation of knowledge for productivity gains may be thought of as a mixture of locally developed knowledge and knowledge imported from the outside. Bathelt, Malmberg, and Maskell (2004) conjecture that it is advantageous for a localized cluster of firms to balance their knowledge inputs along these dimensions. The local diffusion of knowledge and the surrounding atmospheric energy that it encompasses, is termed “buzz” by Bathelt, Malmberg, and Maskell (2004) and others in the literature. While obviously powerful, the extent of this knowledge is limited and tends to be well-diffused in the local community. Complementary and synergistic effects are obtained from knowledge “pipelines.” These pipelines import knowledge from outside the cluster and are similar to weak links or bridges discussed in the network theory literature. From the network literature we know that maintaining ties or “knowledge pipelines” that are connected to external communities are important sources of innovative ideas.

Araújo, Sivva, and Teixeira (2013) argue that the literature on knowledge spillovers has been skewed towards analyzing economically vibrant regions where innovation has taken place at a rapid pace. In those cases, it makes sense to measure innovation using patent data as is often done. Building on this argument, the authors raise an interesting question: are the sources of knowledge spillovers different in economically

depressed areas verse economically developed areas? If a region has a history of economic depression, or simply exhibits slow growth with few if any patents, the volume of intra-regional innovative knowledge spillovers has likely been minimal. The inability for a region to generate its own innovative knowledge suggests that it must rely on knowledge that is imported from outside the region. The authors, focusing on a depressed region of Portugal find that external regional contacts are a crucial and key determinant in productivity.

VI. Conclusion

This paper, drawn from various streams of literature, leads to one conclusion: the intersection of knowledge spillovers, highly educated people, and entrepreneurs capable of recognizing and acting on that knowledge stimulates regional economic growth. A MU should be that intersection. Collaborative research involving students, faculty, and the community is at the heart of a MU. A research program that seeks to improve the effectiveness of collaboration in the long run should benefit all MU stakeholders. Generating sustainable economic growth comes from accumulating human capital that leads to higher labor productivity. Sustainable economic growth, however, is dependent on maintaining the right strategic plan.

This paper proposes such a plan through a research agenda for a MU that is dynamic, meaning it is driven by a philosophy of continuous improvement in the context of better understanding how creative and innovative ideas flow over the various networks embedded in the community. With a better understanding of its role in social and economic networks, a university can gain a competitive advantage through its ability to actively engage in network engineering to improve its effectiveness, rather than passively accepting or even overlooking the existence of such networks. With the right research agenda, a MU can engineer its network status. By complementing its existing agenda with a continuous improvement mindset such as that proposed by Karl Popper, and focused on networks, a MU will be in the unique position to refer to itself as a *dynamic* MU.

References

Adamic, Lada A. and Eytan Adar, 2005, "How to Search a Social Network," *Social Networks*, 27(3), 187-203.

Araújo Liliana, Sandra Sivva and Aurora A. C. Teixeira, 2013, "Knowledge Spillovers and Economically Performance of Firms Located in Depressed Areas: Does Geographical Proximity Matter," FEP Working Papers n. 488, Universidade do Porto.

Bathelt, Harald, Anders Malmberg, and Peter Maskell, 2004, "Clusters and Knowledge: Local buzz, Global Pipelines and the Process of Knowledge Creation," *Progress in Human Geography*, Volume 28, No. 1, 31-56.

Carlino, Gerald A., 2014, "New Ideas in the Air: Cities and Economic Growth," *Business Review*, Philadelphia Federal Reserve, Fourth Quarter.

Carlino, Gerald A., Satyajit Chatterjee, Robert Hunt, 2007, "Urban Density and the Rate of Invention," *Journal of Urban Economics*, 61 (3), 389-419.

Carlino, Gerald and Richard Voith, 1992, "Accounting for Differences in Aggregate State Productivity," *Regional Science and Urban Economics*, 22 (4), 597-617.

Ciccone, Antonio and Robert E. Hall, 1996, "Productivity and the Density of Economic Activity," *American Economic Review*, Vol. 86, No. 1, 54-70.

Eagle, Nathan, Alex (Sandy) Pentland, and David Lazer, 2009, "Inferring friendship network structure by using Mobile Phone Data," *Proceedings of the National Academy of Sciences*, 106 (36), 15274-15278.

Easley, David and Jon Kleinberg, 2010, *Networks, Crowds, and Markets: Reasoning about a Highly Connected World*, Cambridge University Press.

Florida, Richard, 2003, "Cities and the Creative Class," *The City & Community*, American Sociological Association, 1307 New York Avenue, NW, Washington, DC 2000, 5-470.

Florida, Richard, Charlotta Mellander and Kevin Stolarick, 2008, "Inside the Black Box of Regional Development – Human Capital, the Creative Class, and Tolerance," *Journal of Economic Geograghy*, 8(5), 615-649.

Karlsson, Charlie and Urban Gråsjö, 2012, "Knowledge Flows, Knowledge Externalities and Regional Economic Development," working paper 2012/5, CSIR Electronic Working Paper Series.

Kossinets, Gueorgi and Duncan Watts, 2006, "Empirical Analysis of an Evolving Social Network," Science, 311, 88-90.

Laursen, Keld, Francesca Masciarelli, and Andrea Prencipe, 2012, "Regions Matter: How Localized Social Capital Affects Innovate and External Knowledge Acquisition," *Organization Science*, Volume 23, No. 1, January-February, 1526-5455.

Miller, David, 1985, *Popper Selections*, edited by David Miller, Princeton NJ, Princeton University Press.

P Maskell and A Malmberg, 1999, "Localised learning and industrial competitiveness", Cambridge Journal of Economics, 23 (2): 167-185.

Onnela, Jukka-Pekka, Jari Saramäki, Jorkki Hyvönen, György Szabó, David Lazer, Kimmo Kaski, János Kertész, A-L Barabási, 2007, "Structure and Tie Strengths in Mobile Communication Networks," *Proceedings of the National Academy of Sciences*, 104 (18), 7332-7336.

Porter, Michael, 1998, "Clusters and the New Economics of Competition," *Harvard Business Review*, November-December.

Putnam, Robert D. 2000. *Bowling Alone: Collapse and Revival of American Community*, New York: Simon & Schuster.

Şahin, Ayşegül, Joseph Song, Giorgio Topa, and Giovanni L. Violante. 2014. "Mismatch Unemployment." *American Economic Review*, 104(11): 3529-64.